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DISTRIBUTION OF PRESSURE ON FUSELAGE OF AIRPLANE MODEL.

Communication from Rijks-Studiedienst voor de Luchtvaart, of Amsterdam.

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DISTRIBUTION OF PRESSURE ON FUSELAGE OF AIRPLANE MODEL.*

Communication from Rijks-Studiedienst voor de Luchtvaart, of Amsterdam.

In order to study the distribution of the pressure on the surfaces of a fuselage and the influence of the wing on the air flow along these surfaces, we have made tests pertaining to the bottom and one side.

The model employed was the airplane model No. 5, consisting of a thick wing and a fuselage like that of the Fokker F III. Diagrams of the model are given in Figs. 1-3. For measuring the pressure, semicircular metal tubes were sealed into the bottom and one side (Fig. 4). These tubes were covered with brass plates, having 0.5 mm holes at intervals of 10 mm. The outside faces of these plates were made flush with the surface of the model. Both faces were finished very carefully. The wing was removable to permit the study of pressure on the fuselage alone.

The experiments were made in a wind tunnel of the Eiffel type, modified for an air velocity of 28 m/sec.** In order to measure the pressure on one of the holes, all the others were sealed with a mixture of tallow and vaseline. The semicircular tube was connected by a rubber tube to a Fuess inclined alcohol micromanometer. The distribution on the side was determined for an angle of attack

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** A description of the aerodynamic laboratory is published in the "Verslagen en Verhandelingen van den Rijks-Studiedienst voor de Luchvaart."

$\alpha = 0^\circ$ and for yawing angles $\beta = 10^\circ$, 0°, and -10°. The distribution on the bottom was determined for angles of attack of 10°, 5°, 0°, and -5° and a yawing angle of 0°. All these experiments were made both on the complete model and on the fuselage alone.

The results of the experiments are shown in Figs. 5-14. For the distribution on the side, two different pressures were found for some of the holes (Figs. 6 and 9). These differences may be due to a discontinuity of flow along the tapered edges of the front portion of the side. The fuselage was provided with a nose, for the purpose of giving it a better streamlined shape. This nose is indicated in Figs. 1 and 3 by dotted lines. The distribution of the pressure on the side of the model with and without nose is compared in Figs. 5-7. For a yawing angle of 0°, the distribution without nose is practically the same as with.

In Figs. 8-10 we have drawn the curves representing the pressure on the side of the complete model and of the fuselage alone. For yawing angles of 10° and 0°, the pressure on the side of the complete model is greater than on the fuselage alone, indicating a greater velocity in the latter case. For a yawing angle of -10° this difference is only on the rear half of the fuselage. The difference between the pressures is on a portion under the rear of the wing.

The distribution of the pressure on the bottom is shown in Figs. 11-14. Here the pressure on the fuselage alone is also smaller than on the complete model. The difference in the pressure diminishes with a decrease in the angle of attack, hence with the dimimution of the lift.

Summing up our experiments, we have found that the wing, in the case investigated, causes an increase in the pressure, that is to say, a dimimution of the velocity, along the sides of the fuselage. The differences on the bottom of the complete model and the fuselage alone diminished with the angle of attack.

Translated by the National Advisory Committee for Aeronautics.